Institution: Goldsmiths, University of London		
Unit of Assessment: 32, Art and Design: History, Practice and Theory		
Title of case study: The Nuclear Culture Research Project: enabling contemporary nuclear art to influence nuclear debates within the nuclear sector and public sphere.		
Period when the underpinning research was undertaken: 2011- 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	**Role(s) (e.g. job title):**	**Period(s) employed by submitting HEI:**
Dr Ele Carpenter	Reader in Curating, Department of Art Goldsmiths	2009 –
Period when the claimed impact occurred: 2014 - 2020		
Is this case study continued from a case study submitted in 2014? N		

1. Summary of the impact

Led by Dr Carpenter, the **Nuclear Culture Research Project** has influenced the discourse of nuclear art and culture within the arts and nuclear sectors, highlighting the tangible artefacts, infrastructures and lived experiences of radioactive materials and contamination.

Radioactive waste is one of the most urgent issues within contemporary art and society, as anthropogenic radioisotopes will be harmful to humans for millions of years, heightening our present responsibility for the future. By commissioning new artwork, curating exhibitions and hosting roundtable discussions in partnership with nuclear contexts across Europe including the Nuclear Energy Agency and the European Union (EU) Dr Carpenter has informed the strategy of the OECD's Nuclear Energy Agency (NEA) Records, Preservation of Knowledge & Memory Across Generations (RK&M Initiative) and fostered new spaces for trust-building and dialogue about radioactive waste management; which in turn has improved understanding, and challenged mis-conceptions about the relationship between art and nuclear science.

2. Underpinning research

The Nuclear Culture research project began in 2011 when the Submarine Dismantling Project Advisory Group to the Ministry of Defence invited Dr Carpenter to commission contemporary art in response to the dismantling of British nuclear submarines. The research for these commissions led to an exhibition and roundtable at KARST Gallery in Plymouth, near to the laid-up nuclear powered submarines at Devonport **(R1)**. This led to a wider research engagement with the contemporary lived experience of the nuclear economy, including mining, energy, accidents and waste management and the establishment of the Nuclear Culture Project. Working in partnership with arts' agencies, museums, and nuclear organisations, the Nuclear Culture Project brings together visual artists and those working in the nuclear humanities with specific nuclear sites and professionals in the nuclear industry through exhibitions, roundtable events, collaborative research and conferences **(R2)**.

To identify key nuclear cultural concepts in contemporary art, moving beyond cold war politics, Carpenter edited *The Nuclear Culture Source Book* (**R3).** The book includes 12 key essays and over 60 artworks, charting the ways in which art and philosophy contribute to a cultural understanding of the nuclear. In doing so the book brings together contemporary art and ideas investigating the nuclear Anthropocene, nuclear sites and materiality, along with

important questions of radiological inheritance, nuclear modernity and the philosophical concept of radiation as a 'hyperobject'.

Large group exhibitions, curated by Dr Carpeneter, operate as research to investigate specific nuclear contexts. For example, the major international exhibition 'Perpetual Uncertainty' commissioned by Bildmuseet, Umeå University, Sweden provided the opportunity for artist Susan Schuppli to film 'Trace Evidence' near Forsmark, the first nuclear power station to identify fallout from the Chernobyl nuclear disaster **(R4)**. Carpenter invited the Director of MKG, Sweden's NGO advising on geologic storage of spent fuel, to give a keynote lecture at the Nuclear Culture Roundtable at Bildmuseet. The exhibition toured to Z33 House of Contemporary Art, in Hasselt (2017) just a few miles from the Belgian nuclear waste sites and the SCK-CEN nuclear research centre, and to Belgium where it operated as a hub for engaging local nuclear stakeholder groups and invited them to present their work at the roundtable. The exhibition then toured to the Malmö Konstmuseum (2018) where Sofie Tunbrant from the Swedish nuclear waste agency SKB gave a presentation at the roundtable and participated in a performance by Hector Dyer about deep geologic storage and memory. This is just a small example of cross-sector engagement facilitated through the roundtable**s.**

Many of the 22 artworks in the *Perpetual Uncertainty* exhibition were developed through interdisciplinary field research to nuclear sites around the world. For example, visiting the Horonobe Underground Research Centre for radioactive waste burial in Japan (in partnership with S-Air), and the Low Level Waste Ltd site at Drigg in Cumbria, led to Alison Craighead and Jon Thomson's 'Temporary Index' artwork, which involves a series of counters for different waste sites. A new counter has recently been commissioned by the UK Nuclear Decommissioning Authority (NDA) for their Nucleus Archive at Wick, Scotland.

In 2020 Carpenter co-curated Splitting the Atom at CAC/SMK Centre for Contemporary Art and the Energy & Technology Museum in Vilnius, Lithuania. The exhibition was organised in partnership with the AHRC networking project 'Nuclear Cultural Heritage: From Knowledge to Practice' led by Dr Eglė Rindzevičiūtė, University of Kingston **(R6).**

3. References to the research

R1. Carpenter, Ele, 2016. *Material Nuclear Culture*, KARST, Plymouth 17 June– 13 August [Exhibition] Available on request
R2. Carpenter, Ele, Nuclear Culture Project [Website] Available online
R3. Carpenter, Ele, ed. 2016. *Nuclear Culture Source Book*, London: Black Dog Publishing [Edited Book] Submitted to REF2
R4. Carpenter, Ele, 2016. Perpetual Uncertainty, Bildmuseet, Umeå , Sweden [Exhibition] Submitted to REF2
R5. Carpenter, Ele, 2014. Constructing Memory Conference Report (RK&M Verdun), 13 October 2014 [Report] Available online/on request
R6. Carpenter, Ele, 2020. Splitting the Atom, CAC/SMK Centre for Contemporary Art, Vilnius, Lithuania [Exhibition] Available on request
Research Grant: Carpenter, Ele. [PI], 2012-2013, 'Nuclear Culture: A curatorial exploration of the conceptual and cultural challenges of dismantling nuclear submarines', AHRC Fellowship £36,524

4. Details of the impact

"The Nuclear Culture research project […] makes connections between actors and functions that otherwise rarely meet […] This is slowly enabling the nuclear research community to envisage the wider role visual artists can play in long term radioactive waste management, for instance related to marking nuclear sites but also to more fundamental thinking about 'deep time', (in)visibility, uncertainty, the Anthropocene. It has also allowed artists access to nuclear institutes, research and actors which may otherwise seem inaccessible, and to test the preconceptions one may have of such spaces, research and actors"

Jantine Schröder of the Belgian Nuclear Research Centre, SCK CEN, Mol, Belgium, 2018 **(S1)**.

1.Contribution to strategy development informs intergovernmental process of commemoration of nuclear sites:

The Nuclear Energy Agency (NEA) is an intergovernmental agency that facilitates co-operation among countries with advanced nuclear technology infrastructures. It operates within the Organisation for Economic Co-operation and Development (OECD), an intergovernmental organisation of industrialised countries, based in Paris, France. The Records Knowledge and Memory (RK&M) Group is an NEA research unit that investigates how to preserve 'Records, Knowledge and Memory' of high-level radioactive waste for future generations:

In terms of public policy, the RK&M, Modern2020 and the Nuclear Culture project each address Article 24 of the European Union Euratom Directive 2011 which states that:

"It should be an ethical obligation of each Member State to avoid any undue burden on future generations in respect of spent fuel and radioactive waste including any radioactive waste expected from decommissioning of existing nuclear installations. Through the implementation of this Directive Member States will have demonstrated that they have taken reasonable steps to ensure that that objective is met."

Dr Carpenter first got to know members of the RK&M committee when she was invited to present a poster at their conference in Verdun in 2014, alongside artworks by artist Professor Robert Williams, to 168 global experts and nuclear agencies from 17 countries. Forwarding her report on the conference to the RK&M committee and publishing it on her website **(R5)**, Dr Carpenter argued that although the conference consolidated the role of culture within the nuclear waste management discourse, there was little understanding of contemporary art and curatorial practices in the presentation and contextualisation of the artworks at the conference.

The report was well received by Andra (L'Agence nationale pour la gestion des déchets radioactifs / English translation: The French National Radioactive Waste Management Agency) and Dr Carpenter was subsequently invited to participate in the OECD/NEA Radioactive Waste Management Committee RK&M Initiative's 13th Meeting at Nucleus in Wick, Scotland, 13-15 June 2017 to advise on the role of art in RK&M. Testament to 5 years of partnership building and working closely with members of the RK&M group from Belgium, Sweden, France and the UK, many of whom had participated in the Nuclear Culture Roundtable discussions (e.g., Sofie Tunbrant, SKB in Sweden; Jean-Noel Dumont, Andra,

France), Dr Carpenter was the only contemporary art curator invited to participate in the meeting. Schröder confirms the impact of her presentation on the groups in terms of helping

> "to establish a critical space for rethinking how artists can engage with the nuclear sector in Europe and how the nuclear sector can engage with artists" and helping "the group to understand how art can contribute to widening the discourse and potential of preserving RK&M of radioactive waste disposal projects across generations" **(S1)**.

Dr Carpenter also contributed to the RK&M's editorial meeting at Wick, enabling her to review the 'Art' element of the 'Arts, Culture and Education' strategy that informs the RK&M Key Information File, a strategy document that advises government institutions and their Radioactive Waste Management agencies on how to embed knowledge of radioactive storage sites within society for millions of years. The *Final Report of the RK&M Initiative (*2020), directly addresses the role of culture in the process of commemoration;

> "Art with the dedicated goal of RK&M preservation should be specifically commissioned in partnership with art museums and agencies" and gives examples of artworks, from the landscape of thorns proposed for the WIPP in New Mexico, USA; ANDRA's art programme; and the Nuclear Culture Project including works by Thomson & Craighead and Cecile Massart, from the Nuclear Culture Research Group" **(S2)**.

2. Enabling collaboration and discussion between artists, curators, nuclear scientists, professionals from the nuclear industry, sociologists and activists.

As stated by Schröder, Dr Carpenter's contribution to debates about nuclear culture highlights "the way in which artists can create artworks which are distributed across public sites, museum collections, archives and online platforms to increase and preserve awareness, knowledge and memory about disposal projects" **(S1)**.

The Nuclear Culture Research Project's artistic outcomes have influenced the nuclear sector through the Nuclear Culture Roundtable discussions convened within each exhibition. These regular cross-disciplinary dialogues have brought together researchers, sociologists, philosophers, scientists and engineers working in the nuclear industry with artists, curators, activists and NGOs (for instance, Arts Catalyst, London, UK, 2013, 2014; S-Air, Sapporo Japan, 2014; KARST, Plymouth, 2016; Bildmuseet, Umeå , Sweden 2016; DCA, Dundee, 2017; Z33, Belgium, 2017; Malmö Konstmuseum, 2018) **(S3)**.

The partnerships that Dr Carpenter's research facilitate investigate questions of nuclear technology, radiation and the transmission of knowledge over deep time futures. Writing about the exhibition *Perpetual Uncertainty* **(R2)**, Cecilia Widenheim, Director of Malmo Konstmuseum, Sweden describes how the Nuclear Culture Project has enabled a dialogue to take place between different professional fields:

> "The project has allowed us to develop several interdisciplinary collaborations. For the first time we have worked with nuclear researchers and the nuclear power industry in Sweden. The museum ran guided tours for groups from the Medical Radiation Physics Department at Lund University, and the Design Department at Linnaeus University, as well as public and schools groups. In turn a group of Museum staff were invited to visit the Barseback nuclear power plant in the region" **(S4)**.

Ongoing conversations at the Roundtables and across disciplinary fields has enabled people from different disciplines to find a space to think differently, to take care over language, to

share knowledge, to understand how misunderstandings about nuclear knowledge occur, and to imagine the role of visual information in the nuclear industry. For example, the seventh Nuclear Culture Roundtable on the *Underground/Overground* (17 November, 2017 at Z33, Belgium) brought together fifty people from across the arts, nuclear industry, scientific nuclear research and the humanities to discuss how society conceptualises hiding waste underground in relation to daily life on the earth's surface. Taking place on alongside the Belgian edition of the *Perpetual Uncertainty* exhibition and working closely with NIRAS/ONDRAF Belgian National Agency for Radioactive Waste and Enriched Fissile Material, the event focused on art and radioactive waste storage in Belgium, including the problems of: geological storage, the difficulty of communicating or marking contaminated sites for future generations, and the question of designing infrastructures for a deep time future **(S5)**.

The issues of nuclear culture and art have been discussed by several hundred nuclear industry experts attending Dr Carpenter's lectures at conferences such as: the Radiation Protection Society Annual Conference, Scarborough 2019 **(S6)**; and the Modern2020 conference on Nuclear Culture & Citizen Participation, Paris 2019, where Carpenter gave a conference presentation, a research poster, and chaired a roundtable discussion, in partnership with the University of Antwerp as part of the EU Horizon 2020 MODERN Research project **(S7)**.

Press coverage about the project, including BBC Radio 4's programme on Radioactive Art has engaged wider publics in the debate **(S8)**. Meanwhile the exhibitions engage audiences in how nuclear technology has affected our perception of memory, knowledge and time through shifting nuclear aesthetics **(S9)**. Total audience numbers for all three *Perpetual Uncertainty* exhibitions for example were 95,995 persons, with 3,302 participating in public programmes.

5. Sources to corroborate the impact

S1. Testimonial from Jantine Schröder of the Belgian Nuclear Research Centre, SCK CEN Institute for Environment, Health and Safety (EHS), Belgium.
S2. Report: NEA (2020), *Preservation of Records, Knowledge and Memory (RK&M) Across Generations: Final Report of the RK&M Initiative*, Radioactive Waste Management, OECD Publishing, Paris, p144-146.
S3. List of Nuclear Culture Research Group: Events, Roundtable participants and Roundtable discussion topics, 2014-2019.
S4. Testimonial from Cecelia Widenheim, Director Malmo Konstmuseum, Sweden.
S5. Event details: Underground Overground, Nuclear Culture Roundtable, Z33, November 2017, Belgium.
S6. Presentation on Curating Radiation, listed as part of the Radiation Protection Society Annual Conference 21-23 May 2019, UK.
S7. Ele Carpenter, Nuclear Culture & Citizen Participation, (lecture, paper, poster, chair). 2nd International Conference on Monitoring in Geological Disposal of Radioactive Waste 9-11 April 2019, Paris, France.
S8. Debate: Radioactive Art, BBC Radio 4, March 2017.
S9. Testimonial from Angela Hilton, Education Coordinator, KARST, Plymouth, UK.